10 November 2021

Carbon Calculators – Western Australian grain and mixed farm examples

Agricultural practices and farming systems produce greenhouse gases (GHG) emissions. These emissions are mainly in the forms of methane and nitrous oxides. Baselining carbon accounts for individual farms will give total GHG emissions for the farm and the carbon intensity of crops and livestock produced.

Farm baseline accounts include all emissions on farm, emissions from purchases and inputs such as fertiliser, feed, and electricity. These are classified as Scope 1, 2 and 3.

- **Scope 1**: All emissions on-farm from agricultural activity
- **Scope 2**: Emissions from the production of purchased electricity
- **Scope 3**: All emissions associated with producing inputs such as fertilisers, herbicides, veterinary services etc.

It is best for individual farmers or consultants to go through the process of developing a baseline carbon account for their own individual farms to tailor the inputs to that specific enterprise. The quality of the results is dependent on the quality and detail of the data used, so accurate farm records are important.

Here, example farms have been developed for a variety of different regions and enterprise compositions. The data for these examples has been established using the 2019 Planfarm Benchmarks, along with expertise and advice from local agronomists and other industry professionals.

The calculator used is the Greenhouse Accounting Framework (GAF). Using the Cropping GHG Accounting Framework (G-GAF), and the Sheep & Beef GHG Accounting Framework (SB-GAF). These tools were developed and maintained by Primary Industries Challenge Centre and the University of Melbourne.

These calculators use MS Excel spreadsheets and are freely available to download. The tools also align with the Australian National Greenhouse Gas Inventory (NGGI) method. They are simple, intuitive to use and utilise data that should be readily available for a farmer. These tools provide a snapshot of a single years GHG emissions, they report the emissions as carbon equivalents (CO_2e) of Carbon Dioxide (CO_2), Methane (CH_4) and Nitrous Oxide (N_2O).

The spreadsheets do require combining the livestock and cropping calculators results outside of the calculators themselves for mixed enterprises.

The tools are freely available to run you own farm here.

Summary

Comparing the different examples, farm emissions as well as the composition of those emissions can vary greatly. While the Woolbelt mixed farm was the smallest in hectares, it had the largest number of livestock in the system, and the livestock have largely contributed to the farms total emissions compared to the other farm examples. The Eastern Wheatbelt (EW) 100% cropping farm had the lowest total emissions, as it was the farm with the lowest intensity of fertiliser and had no livestock (Figure 1).

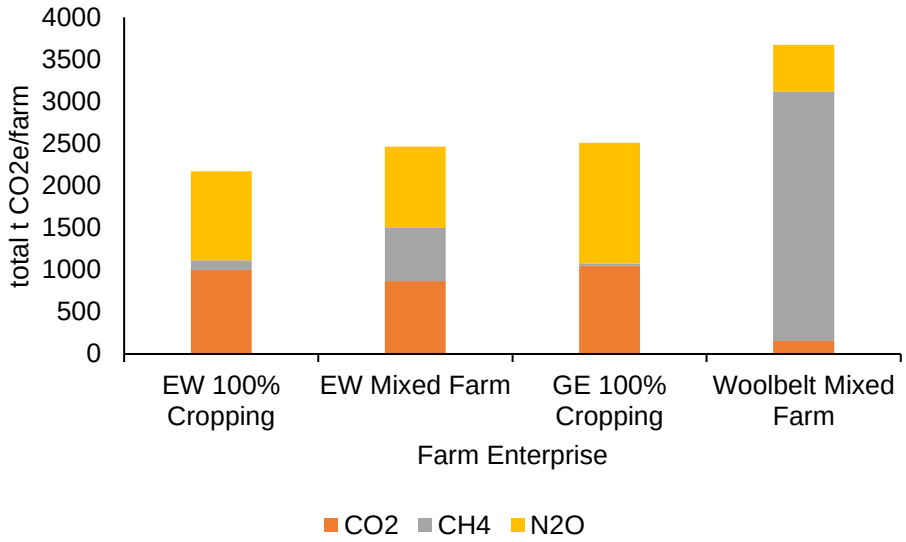

Figure 1 – Comparison of the four different farming systems emission breakdowns.

The emission intensity remained similar between cropping systems however it was higher in the Geraldton (GE) 100% cropping example (table 1).

Table 1 - Emission intensities across four different farming systems.

	Wheat	Barley	Pulses	Oilseeds	Sheep Meat	Sheep Wool
	t CO2-e/t crop	t CO2-e/t crop	t CO2-e/t crop	t CO2-e/t crop	kg CO2-e / kg LW	kg CO2-e / kg greasy
EW 100% Cropping	0.29	0.31	0.24	0.70		
EW Mixed Farm	0.29	0.31	0.24	0.70	8.10	29.40
GE 100% Cropping	0.36	0.41	0.26	0.88		
Woolbelt Mixed Farm	0.29	0.31			7.63	28.54

These farm examples provide some ballpark emission figures and compositions for different farm enterprises and locations. They are jumping off points for producers to then go and utilise their own farm and its systems to investigate their own carbon emissions.

More detail of the farm examples and emissions below.

Contact

Ashleigh Lydon
Development Officer
t +61 (0)8 9892 8462 **| e** ashleigh.lydon@dpird.wa.gov.au

Eastern Wheatbelt

The Eastern Wheatbelt of WA is characterised by low rainfall, low input farming. These farms are generally larger in hectares and have a larger cropping enterprise compared to livestock, with some farms out of livestock completely. Average annual rainfall is 290mm, with 154mm average growing season (April to September). Farm sizes generally range from 4000 to 6000ha arable land. The most common crops grown are wheat, barley, canola with some pulses and legumes also grown.

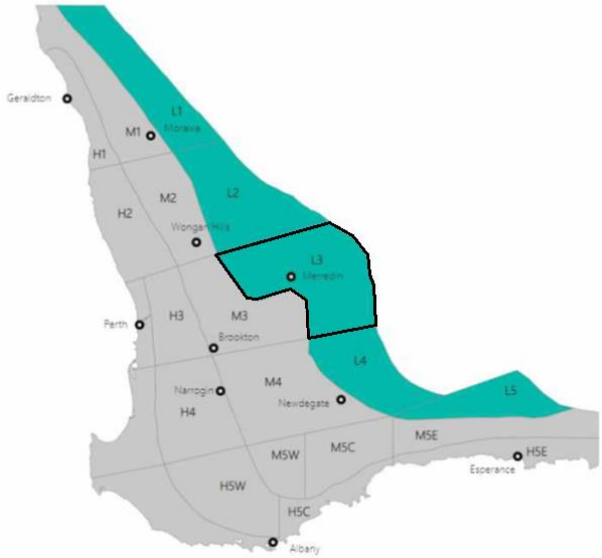

Figure 2 - West Australian agro-ecological zones (Planfarm Benchmarks 2019). Eastern Wheatbelt low rainfall region.

Eastern Wheatbelt 100% Cropping

The 100% cropping example is in the agro-ecological zone L3, near Merredin (Figure 2). It is in a low rainfall (154mm growing season) region and the farm has 4900ha of arable land. Approximately 70% of the annual rotation is sown to cereals (wheat and barley), 20% to oilseeds (canola) and 10% to pulses. The input summary outlines the key inputs used for the carbon calculations (table 2).

Table 2 - Eastern Wheatbelt 100% cropping input summary.

		Wheat	Barley	Pulse	Oilseed
Input Summary	Average grain yield (t/ha)	1.50	1.60	1.20	0.75
	Area sown (ha/farm)	2500	900	500	1000
	Nitrogen Fertiliser Use (kg N/ha)	33	33	0	33
	Urea Application (included in the above) (kg Urea/ha)	25	25	0	25
	Mass of Lime Applied (kg/ha)	1000	1000	0	0
	Fraction of the annual production of crop that is burnt (F) (ha/total crop ha)	0.05	1.00	0	1.00
	Herbicide/Pesticide use (kg total)	7715	2777	2461	5375
	Single Superphosphate (kg/ha)	87	87	87	87
	Annual Diesel Consumption (L/year)	55646	20032	11129	22259

In this 100% cropping example fertiliser and fuel were two of the largest scope 1 emission contributors (figure 3, see appendix A).

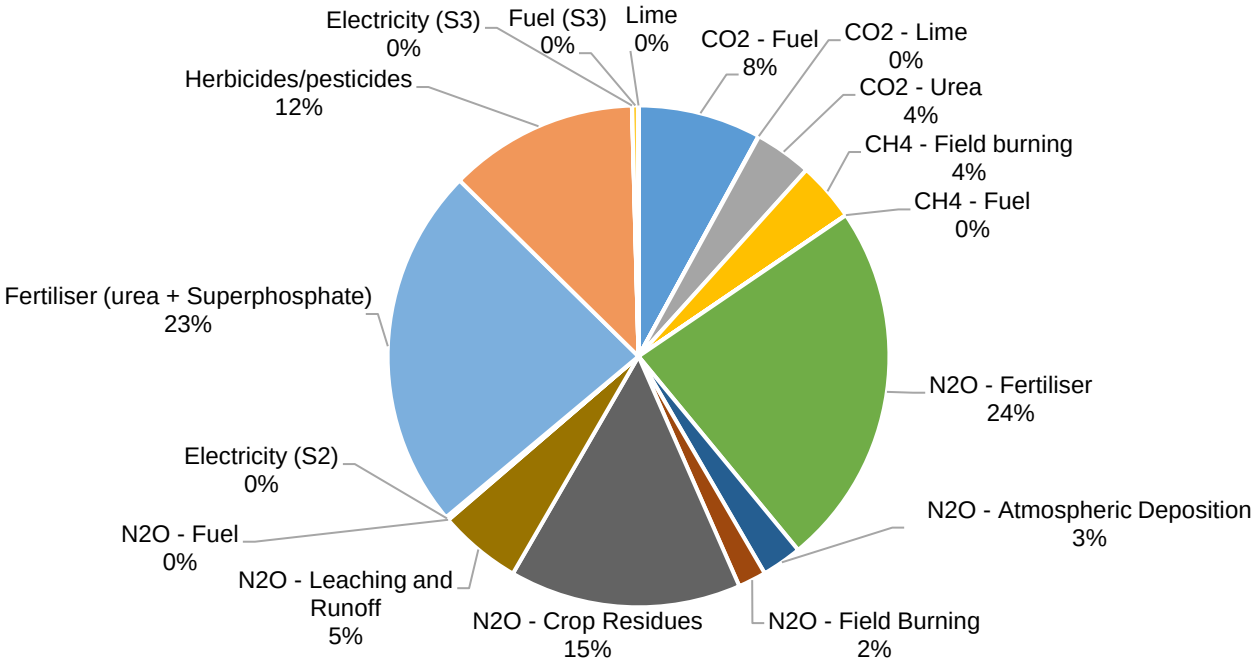

Figure 3 - Eastern Wheatbelt 100% cropping emissions breakdown.

The net farm emissions totalled 2184 t CO_2e/farm. Most of the emissions produced by the wheat crop enterprise, which is to be expected as it is the largest proportion of crop grown (figure 4).

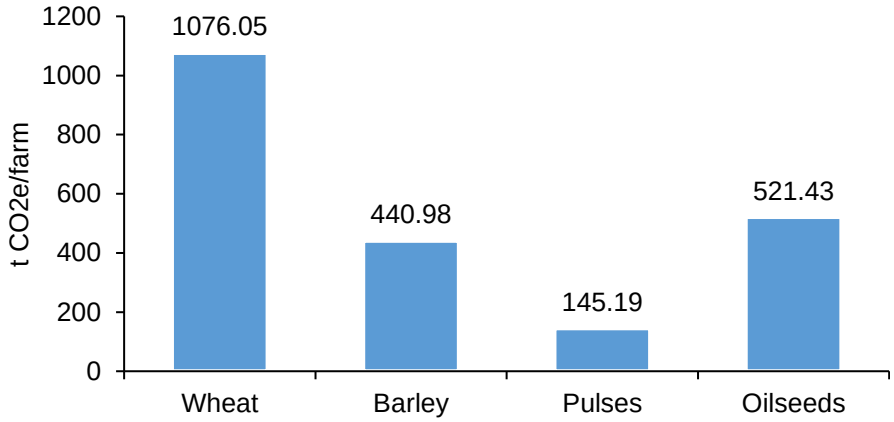

Figure 4 - Eastern Wheatbelt 100% cropping net farm emissions.

The oilseed (canola) crops had the highest emission intensity, whereas the other crops were all reasonably comparable (figure 5).

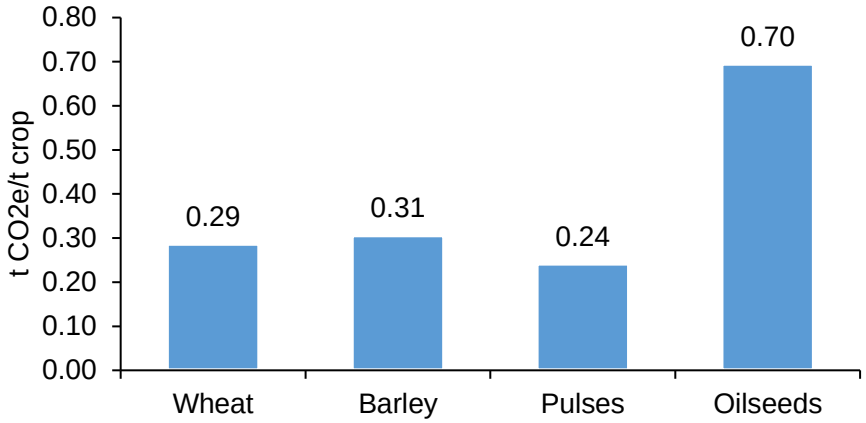

Figure 5 - Eastern Wheatbelt 100% cropping emission summary.

The CO_2e (CO_2 equivalent) emissions were heavily weighted toward carbon dioxide (49%), and nitrous oxide (46%), with very little methane (5%) emissions (figure 6). This is to be expected when sheep are not part of the business.

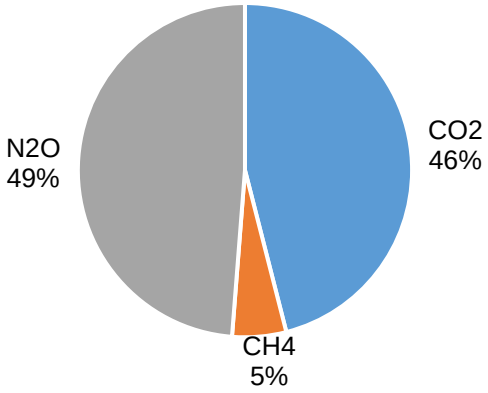

Figure 6 - Eastern Wheatbelt 100% cropping emissions intensity.

Eastern Wheatbelt Mixed Farm

The Eastern Wheatbelt mixed farm example has been based in the same zone as the 100% cropping example (L3, figure 2), with the same low rainfall restraint. The farm has 5000ha of arable land and is an 85% cropping 15% sheep enterprise (4200ha cropping, 800ha pasture). The farm runs a self-replacing merino ewe flock of 1200 ewes. Lambing occurs in June and lambs are turned off before harvest. The farm achieves a 90% lambing rate, and no crop grazing occurs. Pastures are low/no input and often used as breaks or fallows for the cropping rotations, improved pastures are not commonly grown.

The crop proportions are the same as used in the Eastern Wheatbelt 100% cropping, just at reduced hectares to allow for the pasture phase (table 3).

Table 3 - Eastern Wheatbelt mixed farm input summary.

		Wheat	Barley	Pulse	Oilseed
Input Summary	Average grain yield (t/ha)	1.50	1.60	1.20	0.75
	Area sown (ha/farm)	2200	750	400	850
	Nitrogen Fertiliser Use (kg N/ha)	30	30	0	30
	Urea Application (included in the above) (kg Urea/ha)	25	25	0	25
	Mass of Lime Applied (kg/ha)	1000	1000	0	0
	Fraction of the annual production of crop that is burnt (F) (ha/total crop ha)	0.05	1.00	0.00	1.00
	Herbicide/Pesticide use (kg total)	7715	2777	2461	5375
	Single Superphosphate (kg/ha)	87	87	87	87
	Annual Diesel Consumption (L/year)	55646	20033	11129	22259

The largest contributor to emissions in this mixed system was enteric methane (21%) and fertilisers (N_2O fertiliser 18%, scope 3 fertilisers 18%) (see appendix A).

The net farm emissions totalled 2480 t CO_2e/farm. With largest proportion of the emissions coming from the wheat crops, followed by the sheep (figure 7).

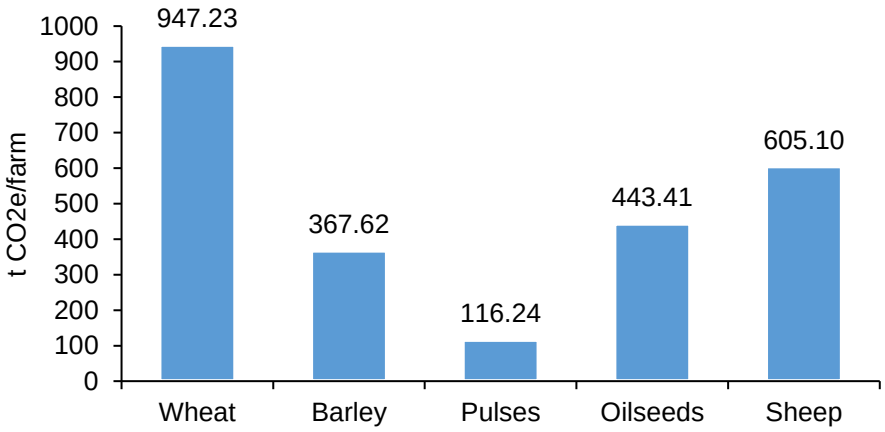

Figure 7 - Eastern Wheatbelt mixed farm net farm emissions.

The emission intensities for the cropping enterprise were the same as the 100% cropping Eastern Wheatbelt farm (figure 5). The sheep aspect of the enterprise observed an emission intensity of 8.10 kg CO_2e/ kg for meat and 29.40 kg CO_2e/ kg greasy for wool (see appendix A).

As to be expected the sheep enterprise contributed largely to the total methane CO_2e emissions compared to cropping and contributed little to the carbon dioxide and nitrous oxide emissions. Overall, 39% of the emissions were from nitrous oxides, 35% from carbon dioxides and 26% from methane (figure 8).

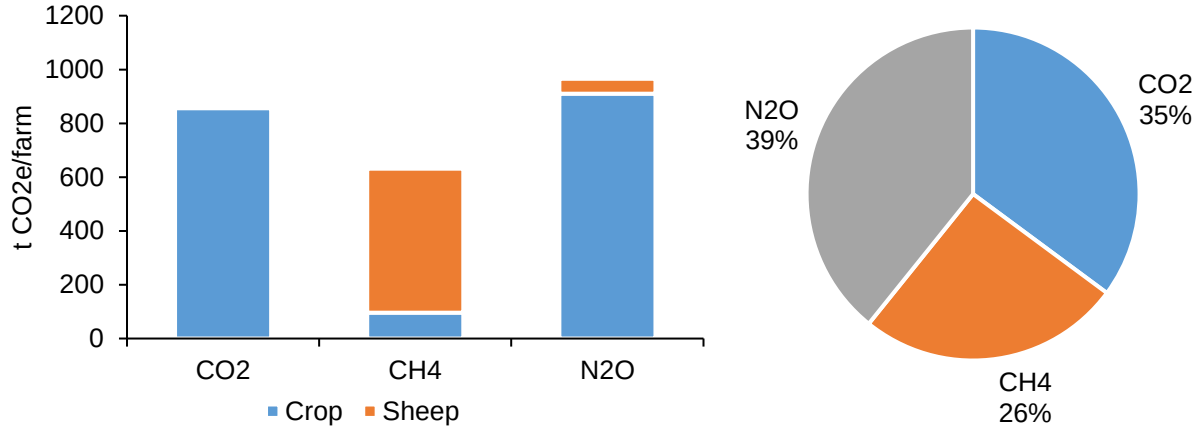

Figure 8 - Eastern Wheatbelt mixed farm crop and sheep emission summary.

Geraldton Medium Rainfall Region

The Geraldton region covers high rainfall regions (500mm) close to the coast to low rainfall regions (250-300mm) towards the eastern and northern margins. These farms are generally larger, have both 100% cropping and mixed enterprises. Livestock numbers are generally found in higher numbers in the Dalwallinu and Northampton shires. Wheat is the primary crop produced, other key crops include lupins, barley, and canola.

This example farm has been situated in the medium rainfall area, in the agro-ecological zone M1 (figure 9). The annual rainfall can vary between 325 and 450mm. This example has a 227mm growing season rainfall (April to September), it is a sole cropping enterprise with no livestock, and has 5450ha of arable land. 67% is sown to cereals (wheat and barley), 15% to pulses (lupins), and 18% to oilseeds (canola).

The input summary outlines the key inputs used for the carbon calculations (table 4).

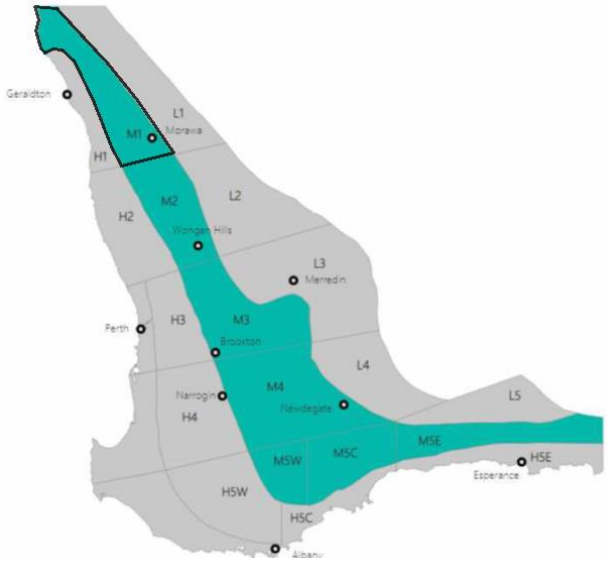

Figure 9 – West Australian agro-ecological zones (Planfarm Benchmarks 2019). Geraldton medium rainfall region.

Table 4 – Geraldton M1 Region 100% cropping input summary.

		Wheat	Barley	Pulse	Oilseed
Input Summary	Average grain yield (t/ha)	1.40	1.20	0.90	0.60
	Area sown (ha/farm)	3000	650	800	1000
	Nitrogen Fertiliser Use (kg N/ha)	54	54	0	54
	Urea Application (included in the above) (kg Urea/ha)	44	44	0	44
	Mass of Lime Applied (kg/ha)	250	0	0	250
	Fraction of the annual production of crop that is burnt (F) (ha/total crop ha)	0	0	0	0
	Herbicide/Pesticide use (kg total)	9258	2006	3937	5375
	Single Superphosphate (kg/ha)	24.3	24.3	24.3	24.3
	Annual Diesel Consumption (L/year)	66776	14468	17807	22259

In this farm example, nitrous oxide fertiliser emissions were the largest contributor to CO_2e emissions (35%), followed by carbon dioxide from fuel (13%) (figure 10, see appendix B)

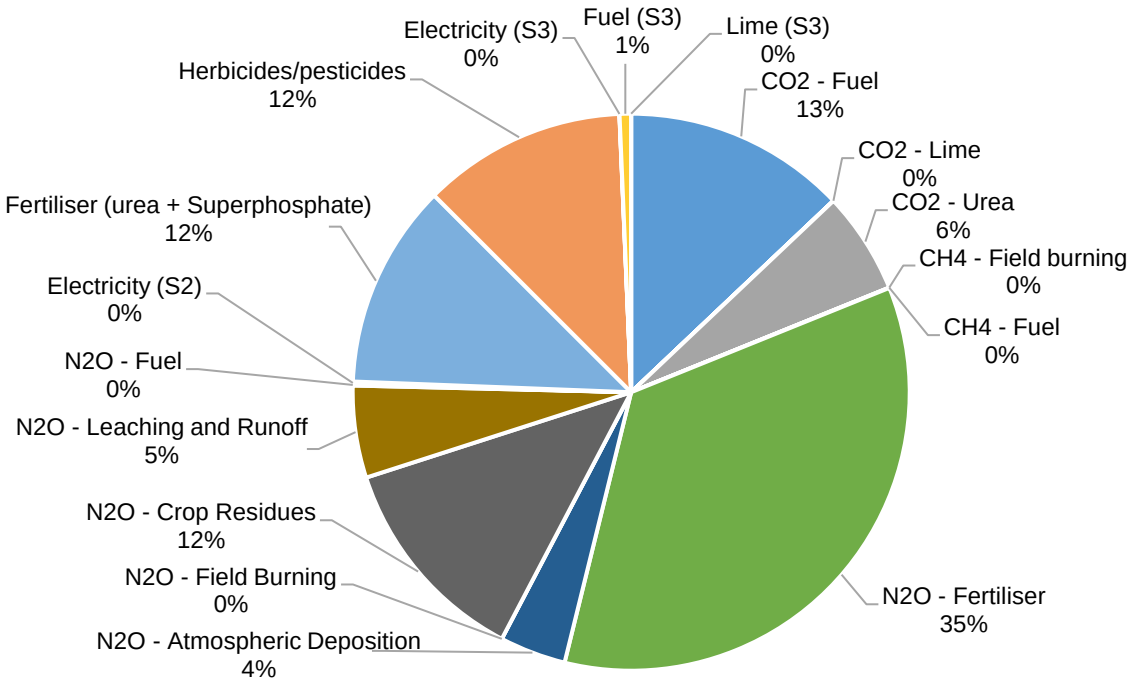

Figure 10 - Geraldton M1 Region 100% cropping total emissions breakdown.

Net farm emissions totalled 2531 t CO_2e/farm. With the largest proportion of emissions coming from Wheat (figure 11).

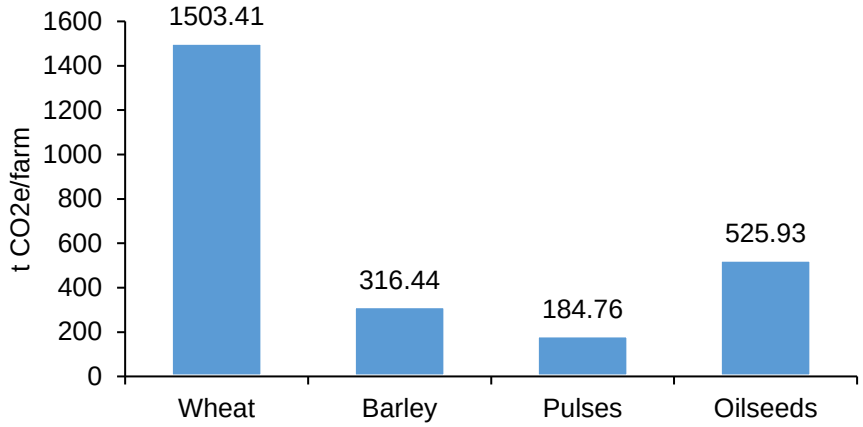

Figure 11 - Geraldton M1 Region 100% cropping net farm emissions.

The oilseed (canola) crops had the highest emission intensity, the wheat and barley crops had similar emission intensities and the pulses had the lowest (figure 12).

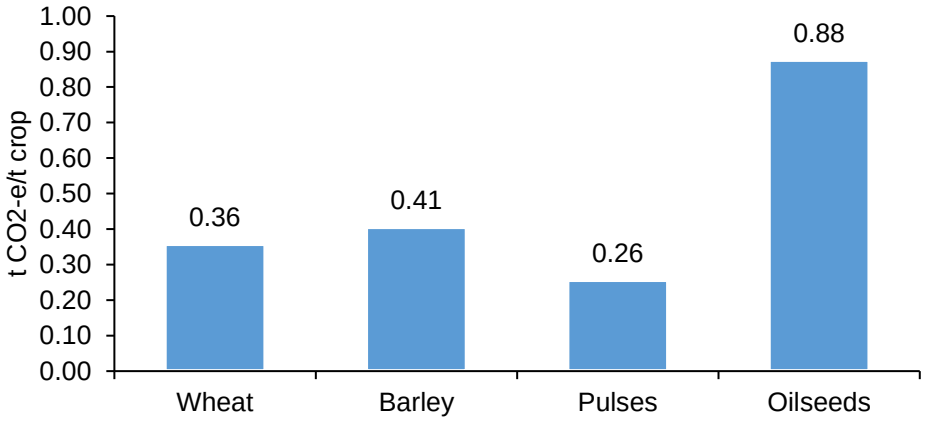

Figure 12 - Geraldton M1 Region 100% cropping emission intensity.

The CO_2e emissions were weighted toward carbon dioxide (57%), and nitrous oxide (47%), with very little Methane (1%) emissions (figure 13). This is to be expected when no sheep are present on farm.

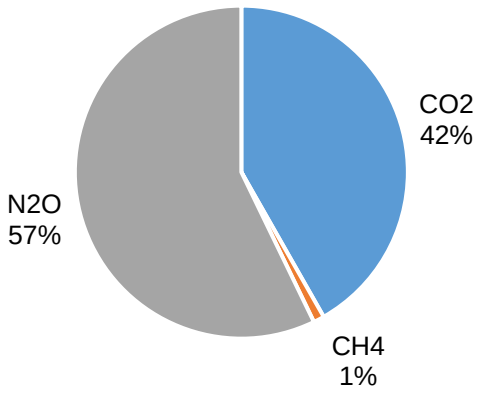

Figure 13 – Geraldton M1 Region 100% Cropping Emission Summary.

Central Woolbelt

The Central Woolbelt covers both medium and high rainfall zones the South West Australian agricultural region. These farms are generally moderate in size, ranging from 3000ha to 4500ha in size and have a larger livestock enterprise, predominantly sheep. Large proportions of farms are also suitable for cropping.

The Central Woolbelt mixed farm example has been based in the agro-ecological zone M4 (figure 14). This zone has annual rainfall averages 385mm. The year of this example experienced 199mm of growing season rainfall (April to September). This farm has 3000ha of arable land available, and 40% of the land is used for the cropping enterprise and 60% for the livestock, sheep enterprise.

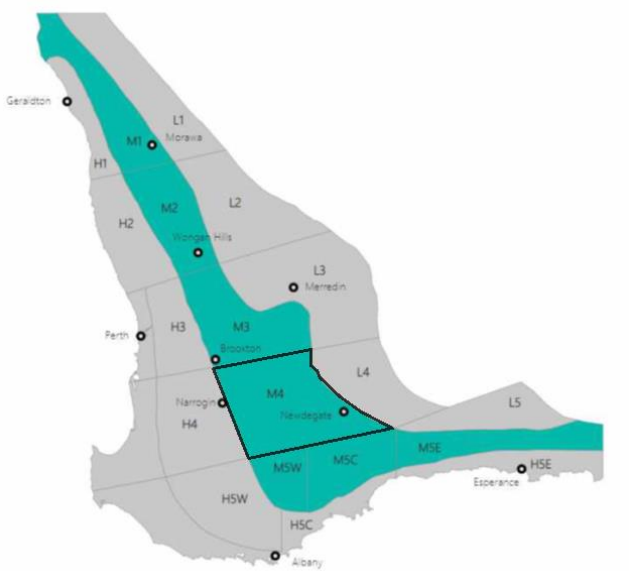

Figure 14 - West Australian agro-ecological zones (Planfarm Benchmarks 2019). Central Woolbelt region.

The sheep enterprise is a self-replacing merino ewe flock of 6000 ewes. Lambing is in June and the farm achieves a 100% lambing rate. No crops are grazed, and pastures are improved, and legume based. Crops grown are wheat and barley (table 5).

Table 5 - Central Woolbelt mixed farm input summary

		Wheat	Barley
Input Summary	Average grain yield (t/ha)	1.95	2.23
	Area sown (ha/farm)	400	600
	Nitrogen Fertiliser Use (kg N/ha)	30	30
	Urea Application (included in the above) (kg Urea/ha)	25	25
	Mass of Lime Applied (kg/ha)	0	0
	Fraction of the annual production of crop that is burnt (F) (ha/total crop ha)	0.05	1.00
	Herbicide/Pesticide use (kg total)	1234	1851
	Single Superphosphate (kg/ha)	8.75	8.75
	Annual Diesel Consumption (L/year)	7733	11600

In this example with a larger sheep enterprise and higher sheep numbers, the main emission contributor is enteric methane (75%) (see appendix C).

Net farm emissions were 3719 t CO_2e/farm. Most of the emissions were observed from the sheep, with wheat and barley contributing very little in comparison (figure 15).

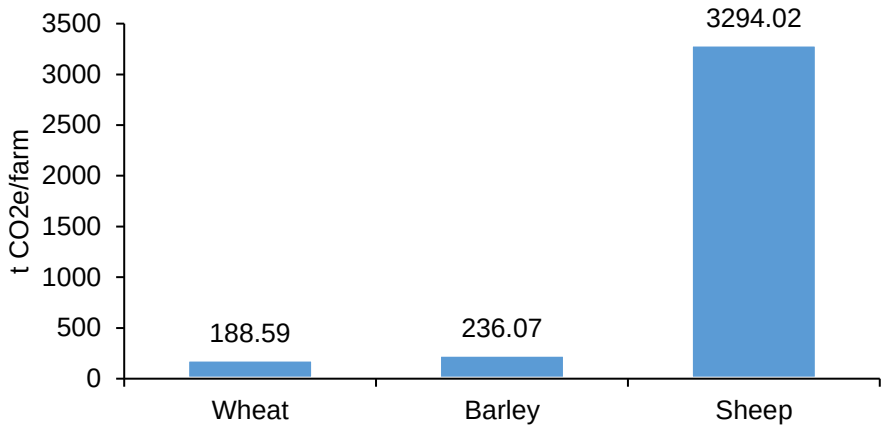

Figure 15 - Central Woolbelt mixed farm net farm emissions.

The emission intensities for the wheat and barley were similar to those observed in the Eastern Wheatbelt examples (wheat 0.29 t CO_2-e/t crop, barley 0.31 t CO_2-e /t crop). The sheep enterprises had an emission intensity of 7.63 kg CO_2-e / kg LW for meat and 28.54 kg CO_2-e / kg greasy for wool.

Farm methane was the major contributor to emissions with 81% of carbon equivalents coming from methane. 15% was contributed from nitrous oxides and 4% from carbon dioxides (figure 16).

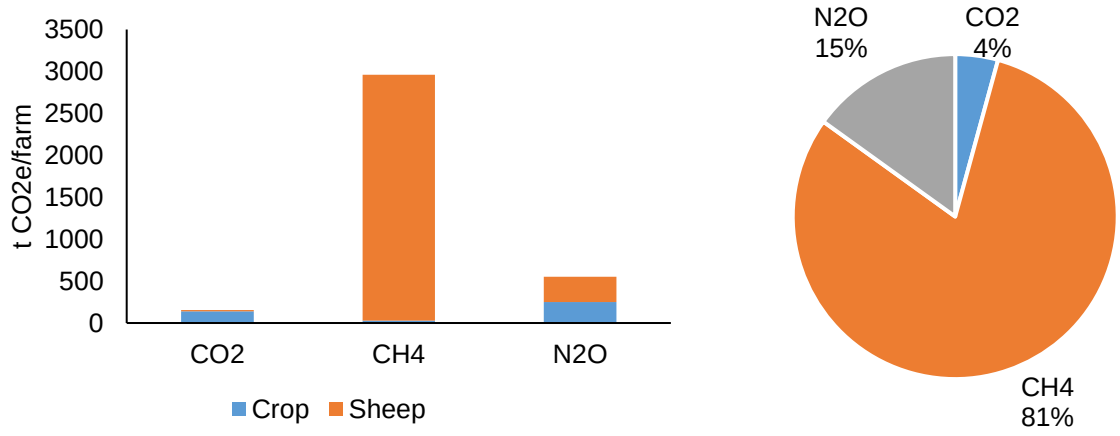

Figure 16 – Central Woolbelt mixed farm crop and sheep emission summary.

The GAF tools are freely available here to run your own farm.

- https://www.piccc.org.au/resources/Tools

Appendix

Appendix A – Eastern Wheatbelt

Table A1 – Eastern Wheatbelt 100% Cropping Summary Outputs.

	Crop	Wheat	Barley	Pulses	Oilseeds	Total
	Outputs	t CO2e/farm	t CO2e/farm	t CO2e/farm	t CO2e/farm	t CO2e/farm
Scope 1 Emissions (on-farm)	CO2 - Fuel	88.42	31.83	17.68	35.37	173.31
	CO2 - Lime	0.40	0.40	0.00	0.00	0.79
	CO2 - Urea	45.83	16.50	0.00	18.33	80.67
	CH4 - Field burning	6.21	39.42	0.00	37.57	83.20
	CH4 - Fuel	0.13	0.05	0.03	0.05	0.25
	N2O - Fertiliser	292.02	105.13	0.00	116.81	513.96
	N2O - Atmospheric Deposition	32.12	11.56	0.00	12.85	56.54
	N2O - Field Burning	2.26	16.71	0.00	20.48	39.44
	N2O - Crop Residues	162.43	58.96	37.43	67.17	325.99
	N2O - Leaching and Runoff	60.30	21.83	9.88	24.70	116.71
	N2O - Fuel	0.44	0.16	0.09	0.18	0.87
	Scope 1 Total	**690.56**	**302.55**	**65.12**	**333.50**	**1391.72**
Scope 2 Emissions (off-farm)	Electricity	2.07	0.414	0.414	1.242	4.14
	Scope 2 Total	**2.07**	**0.41**	**0.41**	**1.242**	**4.14**
Scope 3 Emissions (pre-farm)	Fertiliser (urea + Superphosphate)	266.47	95.93	42.92	106.59	511.90
	Herbicides/pesticides	112.26	40.41	35.80	78.21	266.69
	Electricity	0.12	0.02	0.02	0.07	0.24
	Fuel	4.55	1.64	0.91	1.82	8.93
	Lime	0.01	0.01	0.00	0.00	0.03
	Scope 3 Total	**383.42**	**138.02**	**79.66**	**186.69**	**787.78**
	Carbon sequestration in trees	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	Net Farm Emissions	**1076.05**	**440.98**	**145.19**	**521.43**	**2183.64**
	Emissions intensity t CO2-e/t crop	**0.29**	**0.31**	**0.24**	**0.70**	

Table A2 - Eastern Wheatbelt 100% Cropping GHG summary.

Summary	t CO2e/farm
CO2	998.67
CH4	113.43
N2O	1058.23

Table A3 – Eastern Wheatbelt Mixed Farm Summary Outputs.

	Crop	Wheat	Barley	Pulses	Oilseeds	Sheep	Total
	Outputs	t CO2e/farm	t CO2e/farm	t CO2e/farm	t CO2e/farm	t CO2e/farm	t CO2e/farm
Scope 1 Emissions (on-farm)	CO2 - Fuel	77.81	26.53	14.15	30.06	8.57	157.12
	CO2 - Lime	0.40	0.40	0.00	0.00	0.00	0.79
	CO2 - Urea	40.33	13.75	0.00	15.58	0.00	69.67
	CH4 - Field burning	5.46	32.85	0.00	31.94	0.00	70.25
	CH4 - Fuel	0.11	0.04	0.02	0.04	0.02	0.23
	CH4 - Enteric	0.00	0.00	0.00	0.00	511.90	511.90
	CH4 - Manure Management	0.00	0.00	0.00	0.00	23.29	23.29
	CH4 - Savannah Burning	0.00	0.00	0.00	0.00	0.00	0.00
	N2O - Fertiliser	256.98	87.61	0.00	99.29	0.00	443.87
	N2O - Urine and Dung	0.00	0.00	0.00	0.00	31.31	31.31
	N2O - Atmospheric Deposition	28.27	9.64	0.00	10.92	3.29	52.11
	N2O - Savannah Burning	0.00	0.00	0.00	0.00	0.00	0.00
	N2O - Field Burning	1.99	13.92	0.00	17.40	0.00	33.31
	N2O - Crop Residues	142.94	49.13	29.95	57.09	0.00	279.11
	N2O - Leaching and Runoff	53.06	18.19	7.91	20.99	20.66	120.82
	N2O - Fuel	0.39	0.13	0.07	0.15	0.06	0.80
	Scope 1 Total	**607.74**	**252.19**	**52.09**	**283.47**	**599.09**	**1794.59**
Scope 2 Emissions (off-farm)	Electricity	2.07	0.41	0.41	1.24	1.04	5.18
	Scope 2 Total	**2.07**	**0.41**	**0.41**	**1.24**	**1.04**	**5.18**
Scope 3 Emissions (pre-farm)	Fertiliser (urea + Superphosphate)	234.49	79.94	34.34	90.60	0.00	439.37
	Purchased feed	0.00	0.00	0.00	0.00	0.00	0.00
	Herbicides/pesticides	98.79	33.68	28.64	66.48	0.00	227.59
	Electricity	0.12	0.02	0.02	0.07	0.06	0.30
	Fuel	4.01	1.37	0.73	1.55	0.44	8.10
	Lime	0.01	0.01	0.00	0.00	0.00	0.03
	Purchased livestock	0.00	0.00	0.00	0.00	4.46	4.46
	Livestock on agistment	0.00	0.00	0.00	0.00	0.00	0.00
	Scope 3 Total	**337.42**	**115.02**	**63.73**	**158.70**	**4.97**	**679.84**
	Net Farm Emissions	947.23	367.62	116.24	443.41	605.10	

Table A4 – Eastern Wheatbelt Mixed Farm emission intensity summary.

	Wheat t CO2-e/t crop	Barley t CO2-e/t crop	Pulses t CO2-e/t crop	Oilseeds t CO2-e/t crop	Sheep Meat kg CO2-e / kg LW	Sheep Wool kg CO2-e / kg greasy
Emissions intensity	0.29	0.31	0.24	0.70	8.10	29.40

Table A5 - Eastern Wheatbelt Mixed Farm GHG summary.

Summary	Crop	Sheep	Total
Outputs	t CO2e/farm	t CO2e/farm	t CO2e/farm
CO2	856.26	8.57	864.83
CH4	96.14	535.21	631.35
N2O	910.07	55.31	965.38

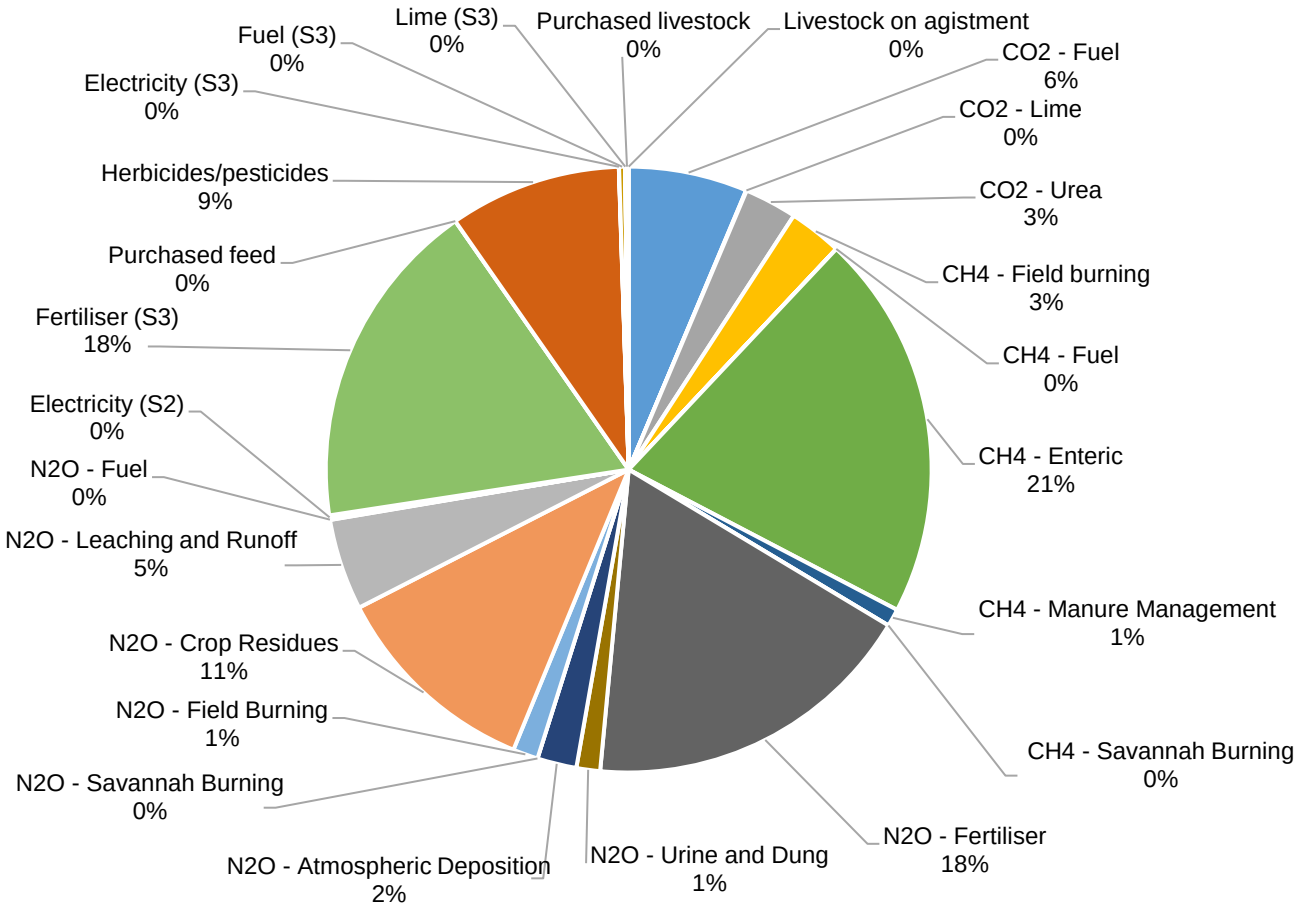

Figure A1 – Eastern Whetbelt Mixed Farm total emissions breakdown.

Appendix B – Geraldton Medium Rainfall Region

Table B1 – Geraldton Medium Rainfall 100% Cropping Summary Outputs.

	Crop	Wheat	Barley	Pulses	Oilseeds	Total
	Outputs	t CO2e/farm	t CO2e/farm	t CO2e/farm	t CO2e/farm	t CO2e/farm
Scope 1 Emissions (on-farm)	CO2 - Fuel	180.17	39.04	48.05	60.06	327.31
	CO2 - Lime	0.11	0.00	0.00	0.11	0.23
	CO2 - Urea	96.80	20.97	0.00	32.27	150.04
	CH4 - Field burning	0.00	0.00	0.00	0.00	0.00
	CH4 - Fuel	0.26	0.06	0.07	0.09	0.47
	N2O - Fertiliser	570.66	123.64	0.00	190.22	884.52
	N2O - Atmospheric Deposition	62.77	13.60	0.00	20.92	97.30
	N2O - Field Burning	0.00	0.00	0.00	0.00	0.00
	N2O - Crop Residues	181.92	31.93	44.92	53.73	312.51
	N2O - Leaching and Runoff	82.06	15.80	11.86	25.53	135.25
	N2O - Fuel	0.90	0.20	0.24	0.30	1.64
	Scope 1 Total	**1175.66**	**245.24**	**105.13**	**383.23**	**1909.27**
Scope 2 Emissions (off-farm)	Electricity	2.07	0.621	0.621	0.828	4.14
	Scope 2 Total	**2.07**	**0.621**	**0.621**	**0.828**	**4.14**
Scope 3 Emissions (pre-farm)	Fertiliser (urea + Superphosphate)	181.56	39.34	19.21	60.52	300.63
	Herbicides/pesticides	134.72	29.19	57.28	78.21	299.39
	Electricity	0.12	0.04	0.04	0.05	0.24
	Fuel	9.28	2.01	2.47	3.09	16.86
	Lime	0.00	0.00	0.00	0.00	0.01
	Scope 3 Total	**325.68**	**70.57**	**79.00**	**141.88**	**617.13**
	Carbon sequestration in trees	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	Net Farm Emissions	**1503.41**	**316.44**	**184.76**	**525.93**	**2530.54**
	Emissions intensity t CO2-e/t crop	**0.36**	**0.41**	**0.26**	**0.88**	

Table B2 - Geraldton Medium Rainfall 100% Cropping GHG Summary.

Summary	t CO2e/farm
CO2	1047.98
CH4	26.60
N2O	1434.72

Appendix C – Central Woolbelt

Table C1 – Central Woolbelt Mixed Farm Summary Outputs.

	Crop	Wheat	Barley	Sheep	Total
	Outputs	t CO2e/farm	t CO2e/farm	t CO2e/farm	t CO2e/farm
Scope 1 Emissions (on-farm)	CO2 - Fuel	20.87	31.30	15.00	67.16
	CO2 - Lime	0.00	0.00	0.00	0.00
	CO2 - Urea	7.33	11.00	0.00	18.33
	CH4 - Field burning	25.83	0.00	0.00	25.83
	CH4 - Fuel	0.03	0.04	0.03	0.10
	CH4 - Enteric	0.00	0.00	2804.88	2804.88
	CH4 - Manure Management	0.00	0.00	128.10	128.10
	CH4 - Savannah Burning	0.00	0.00	0.00	0.00
	N2O - Fertiliser	42.48	63.71	0.00	106.19
	N2O - Urine and Dung	0.00	0.00	172.35	172.35
	N2O - Atmospheric Deposition	4.67	7.01	18.10	29.78
	N2O - Savannah Burning	0.00	0.00	0.00	0.00
	N2O - Field Burning	9.38	0.00	0.00	9.38
	N2O - Crop Residues	33.79	56.01	0.00	89.79
	N2O - Leaching and Runoff	11.86	19.20	113.75	144.81
	N2O - Fuel	0.10	0.16	0.09	0.35
	Scope 1 Total	**156.34**	**188.43**	**3252.30**	**3597.07**
Scope 2 Emissions (off-farm)	Electricity	1.38	1.38	3.45	6.21
	Scope 2 Total	**1.38**	**1.38**	**3.45**	**6.21**
Scope 3 Emissions (pre-farm)	Fertiliser (urea + Superphosphate)	11.75	17.63	0.10	29.48
	Purchased feed	0.00	0.00	0.00	0.00
	Herbicides/pesticides	17.96	26.94	0.00	44.90
	Electricity	0.08	0.08	0.20	0.36
	Fuel	1.07	1.61	0.78	3.46
	Lime	0.00	0.00	0.00	0.00
	Purchased livestock	0.00	0.00	37.20	37.20
	Livestock on agistment	0.00	0.00	0.00	0.00
	Scope 3 Total	**30.87**	**46.26**	**38.27**	**115.40**

Net Farm Emissions	188.59	236.07	3294.02	3718.69

Table C2 – Central Woolbelt Mixed Farm emission intensity summary.

	Wheat	Barley	Sheep Meat	Sheep Wool
	t CO2-e/t crop	t CO2-e/t crop	kg CO2-e / kg LW	kg CO2-e / kg greasy
Emissions intensity	0.29	0.31	7.63	28.54

Table C3 – Central Woolbelt Mixed Farm GHG Summary.

Summary	Crop	Sheep	t CO2e/farm
CO2	141.01	15.09	156.11
CH4	29.24	2933.01	2962.25
N2O	248.80	304.29	553.10

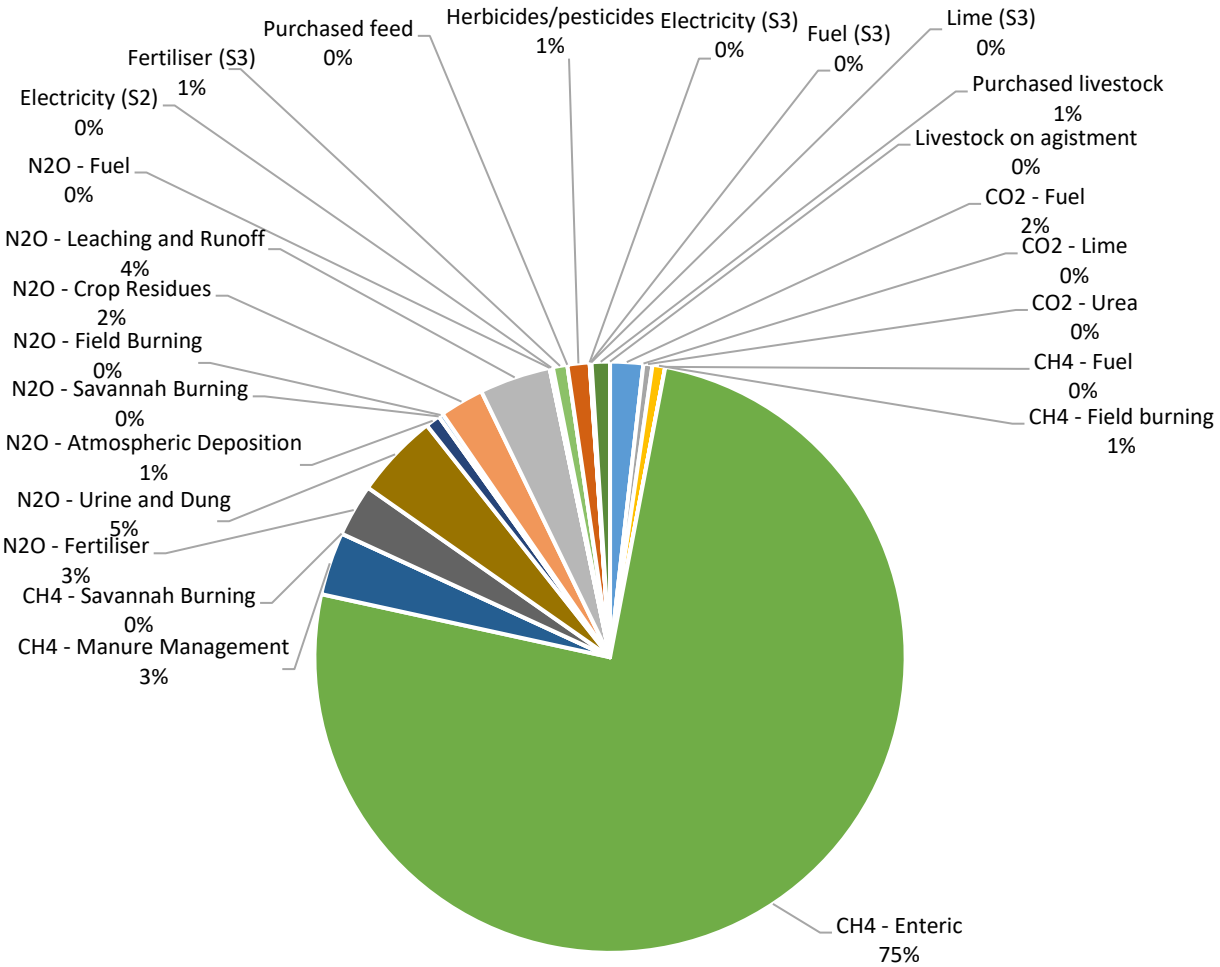

Figure C1 – Central Woolbelt Mixed Farm total emissions breakdown.